



Oregon

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August 26, 2025

Bob Wyatt
NW Natural
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via electronic delivery (email)

Re: DEQ Comments on the Segment 3 Well Installation Work Plan, IRAM ISS Bench Scale Treatability Study Work Plan, and IRAM Data Gaps Investigation Work Plan Former Gasco Manufactured Gas Plant Operable Unit Portland, Oregon ECSI# 84 and # 183

Bob Wyatt:

The Oregon Department of Environmental Quality (DEQ) reviewed the *Segment 3 Well Installation Work Plan*¹ (Segment 3 Work Plan), *IRAM ISS Bench Scale Treatability Study Work Plan*² (IRAM TSWP), and *IRAM Data Gaps Investigation Work Plan*³ (IRAM DGWP), collectively the Work Plans. The Work Plans were submitted as Appendix C, D, and E to the *Interim Removal Action Measure Basis of Design Report*⁴ (IRAM BODR), respectively. The IRAM BODR and Work Plans were prepared under the Voluntary Agreement for Remedial Investigation/Feasibility Study, as amended^{5,6,7}. At NW Natural's request, DEQ has prioritized our review of the Work Plans in advance of the IRAM BODR.

DEQ approves the Segment 3 Work Plan, with comments. DEQ does not approve the IRAM TSWP or IRAM DGWP. Please revise and resubmit the IRAM TSWP and IRAM DGWP to address our comments, which are attached to this letter.

Please contact me at (971) 263-8822 or Wesley.Thomas@deq.oregon.gov if you have questions regarding this letter.

Sincerely,

Wesley A. Thomas
Project Manager
NWR Cleanup Section

¹ Anchor QEA. 2025. Segment 3 Well Installation Work Plan. Prepared for NW Natural. May 9.

² Anchor QEA. 2025. IRAM ISS Bench Scale Treatability Study Work Plan. Prepared for NW Natural. May 9.

³ Anchor QEA. 2025. IRAM Data Gaps Investigation Work Plan. Prepared for NW Natural. May 9.

⁴ Anchor QEA, Ede Environmental, LLC, and Severson Environmental Services, Inc. 2025. Interim Removal Action Measure Basis of Design Report. Prepared for NW Natural. May 9.

⁵ DEQ. 1994. Voluntary Agreement for Remedial Investigation/Feasibility Study. DEQ No. WMCVC-NWR-94-13. August 8.

⁶ DEQ. 2006. First Addendum to Voluntary Agreement for Remedial Investigation/Feasibility Study. DEQ No. WMCVC-NWR-94-13. July 19.

⁷ DEQ. 2016. Second Addendum to Voluntary Agreement for Remedial Investigation/Feasibility Study. DEQ No. WMCVC-NWR-94-13. October 11.

Attachments

Attachment 1: DEQ Comments on the Segment 3 Work Plan

Attachment 2: DEQ Comments on the IRAM TSWP

Attachment 3: DEQ Comments on the IRAM DGWP

EC: Dan Hafley, DEQ
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Audrey Hackett, MFA
David Rabbino, Jordan Ramis
Myron Burr, Restoration Strategies

CC: ECSI No. 84 File
ECSI No. 183 File

Attachment 1
DEQ Comments on the Segment 3 Work Plan

Introduction

DEQ approves the Segment 3 Work Plan with the following comments.

Specific Comments

- 1) **Section 2.4, Equipment Decontamination Procedures.** Please add a solvent rinse step (e.g. hexane) if visible contamination is observed (e.g. non-aqueous phase liquid, tar, etc.).
- 2) **Section 3, Reporting.** Please clarify the proposed sampling frequency and analyte list for the newly installed monitoring wells.
- 1) **Table C-1, Proposed Segment 3 Well Locations and Screen Intervals.** The screen intervals for MW-55U and MW-54L appear to be switched. Please double check and confirm the information in this table.

Attachment 2 DEQ Comments on the IRAM TSWP

Introduction

DEQ does not approve the IRAM TSWP. Our comments on the IRAM TSWP are provided below. Please note that revisions to multiple sections, including the IRAM TSWP attachments (e.g., field sampling plan), may be required to address our Specific Comments.

General Comments

- 1) The IRAM TSWP relies on the results of the Phase I treatability study completed as part of the *Final In Situ Stabilization and Solidification Bench Scale Treatability Study Work Plan*⁸. To our knowledge, NW Natural has only reported the Phase I treatability study results for one sediment sample (ISSTS-003; reported in the *Final Revised In Situ Stabilization and Solidification Bench Scale Treatability Study Location ISSTS-003 Data Summary Memorandum*⁹, provided as Appendix H of the *Final In Situ Stabilization and Solidification Field Pilot Study Work Plan*¹⁰). ISSTS-003 was collected from sediment within or near the in-water field pilot study area, and DEQ does not consider this treatability testing result sufficiently representative of upland soil. Selection of an appropriate grout composition for the IRAM must be based on test results for representative upland soils. Phase I testing should be conducted for each stratum (e.g., fill, upper alluvium, lower alluvium) to ensure that the selected grout composition will achieve the desired criteria across a range of potential soil textures. Testing should also consider the varying nature of contamination and manufactured gas plant (MGP) residuals at individual locations. If NW Natural would like to propose use of Phase I treatability study results for riverbank soils, the results must first be reported, and NW Natural should provide additional rationale supporting their use.
- 2) The IRAM BODR indicates that when constructing the barrier wall, a bentonite slurry will be injected during the mixing equipment downstroke, and grout will be injected on the upstroke. The result of this approach will be a barrier wall constructed from a bentonite/grout mixture. It is not clear whether the in-situ stabilization and solidification (ISS) treatment in the nearshore upland ISS area of interest will involve a similar process, or if grout will be used on both the upstroke and downstroke. Regardless, the treatability testing mix design should include bentonite at proportions anticipated during barrier wall construction to ensure that the treatability testing results are representative of constructed conditions. If the bulk ISS treatment will not include bentonite on the downstroke, then grout mix designs that do not include bentonite in the grout mix design should also be tested.
- 3) The IRAM TSWP does not clearly describe or explain the sample homogenization approach or the criteria for identifying six representative samples to proceed into Phase I and Phase II treatability testing.
 - a) Please revise the IRAM TSWP to clarify how soil will be homogenized. DEQ believes that each boring should result in at least 3 composite samples, one representing the fill, one representing the upper alluvium, and one representing the lower alluvium. DEQ does not believe compositing samples from different strata together is appropriate.
 - b) Please revise the IRAM TSWP to explain the criteria for selecting samples to move forward into Phase I and II testing. DEQ believes that the full distribution of various MGP residuals from different locations and strata should be accounted for in the treatability testing, and that it would

⁸ Anchor QEA. 2023. Final In Situ Stabilization and Solidification Bench Scale Treatability Study Work Plan. Gasco Sediments Cleanup Action. Prepared on behalf of NW Natural. November 30.

⁹ Anchor QEA. 2023. Final Revised In Situ Stabilization and Solidification Bench Scale Treatability Study Location ISSTS-003 Data Summary Memorandum. September 12.

¹⁰ Anchor QEA. 2024. Final In Situ Stabilization and Solidification Field Pilot Study Work Plan. Gasco Sediments Cleanup Action. Prepared on behalf of NW Natural. January 11.

be inappropriate to composite a sample containing MGP residuals with another sample/location from the same stratum that contains either no or different MGP residuals. Ultimately the treatability testing must address each unique combination of MGP residuals (at representative concentrations) and soil textures. It is unclear whether six samples will appropriately represent the full range of potential subsurface conditions.

- 4) The treatability testing sample collected from the fill at the ISSUTS-002 location will likely include spent oxides. ISS of spent oxides should consider lessons learned during remediation activities at the Hunt's Point MGP project. ISS mix designs at the Hunt's Point MGP project required the ability to adjust/buffer pH due to acidic conditions. Spent oxides contain iron sulfides, which are acidic and can become more acidic over time when exposed to oxygen. The alkalinity demand for spent oxides should be considered in the grout mix design.

Specific Comments

- 1) **Section 1, Introduction.** DEQ does not agree with information included in the last two paragraphs of this section. Our comments on the IRAM BODR will provide additional comments on these statements. To expedite DEQ approval of a revised IRAM TSWP, NW Natural should delete these paragraphs.
- 2) **Section 2.1.1, Physical Property Testing Objectives and Evaluation Criteria.** DEQ has the following comments:
 - a) DEQ does not approve the proposed preliminary strength goal of 20 pounds per square inch (psi), which is significantly lower than the typical literature-based ISS strength target of 50 psi. The IRAM TSWP cites the *Technology Performance Review: Selecting and Using Solidification/Stabilization Treatment for Site Remediation*¹¹ guidance and the *Development of Performance Specifications for Solidification/Stabilization*¹² guidance as the basis for hydraulic conductivity performance targets, but does not consider these technical guidance documents applicable for developing strength performance targets. Both guidance documents consider compressive strength performance targets as analogous to long-term durability of ISS-treated soils against environmental attack (e.g., freeze/thaw) in addition to short- and long-term loading related to construction equipment and site use, respectively. Further, NW Natural previously identified 50 psi as a reasonable and appropriate preliminary strength goal in the *In Situ Stabilization and Solidification Laboratory Pilot Study Work Plan*¹³. The IRAM BODR does not include an engineering evaluation explaining or justifying a change in strength performance targets since NW Natural proposed 50 psi in 2022. The proposed 20-psi strength performance target is only supported with a statement that the IRAM footprint will be subjected to minimal post-construction loading. DEQ agrees that the ISS strength performance target should consider long-term durability, and short- and long-term loading. The IRAM BODR should describe the engineering evaluations NW Natural plans to use to select a final ISS strength target. These evaluations should include evaluation of loading induced by ISS equipment. Target strength requirements must consider the ground pressure induced during the upstroke of the ISS equipment, particularly at depths exceeding 100 feet below the ground surface. For reference, at a nearby site, the remedial design determined that a target strength of 60 psi was necessary to

¹¹ EPA. 2009. *Technology Performance Review: Selecting and Using Solidification/Stabilization Treatment for Site Remediation*. National Risk Management Research Laboratory. EPA/600/R-09/148. November.

¹² Interstate Technology and Regulatory Council (ITRC). 2011. *Development of Performance Specifications for Solidification/Stabilization*. July.

¹³ Anchor QEA, LLC. 2022. *In Situ Stabilization and Solidification Laboratory Pilot Study Work Plan, Gasco Sediments Cleanup Action*. Prepared on behalf of NW Natural. October 31.

accommodate ground pressures from smaller ISS equipment operating on crane mats and extending auger tooling to shallower depths. DEQ recommends adopting a higher preliminary strength goal that is more consistent with the strength range commonly applied at other ISS cleanup sites, and revisiting the preliminary strength goal as the IRAM design more fully evaluates strength requirements.

- b) The second paragraph states that the design bearing capacity evaluations will account for the scatter of the measured strengths for the various grout dosages at each of the treatability study sampling locations to support determination of the range of acceptable strengths. The bearing capacity requirements, and thus the performance targets for strength, should be based on the anticipated ground pressures associated with construction activities and long-term site use, rather than assigning the range of acceptable bearing capacities based on the treatability study results.
- 3) **Section 2.1.2, Leachability Testing Objectives and Evaluation Criteria.** DEQ considers leaching reduction from ISS-treated soils and manufactured gas plant (MGP) residuals necessary for achieving IRAM source control and removal action objectives (SC/RAOs). DEQ recommends selection of a grout mix and dose that achieves strength and permeability performance targets and that provides the lowest resultant leachability. NW Natural may also consider developing quantitative a preliminary leaching reduction goals for select COCs.
 - 4) **Section 3.2, Initial Characterization Untreated Soil Samples.** DEQ has the following comments:
 - a) The analyte list for untreated soil samples should include the full suite of PAHs identified as upland groundwater contaminants of concern (COCs) for the aquatic life pathway, not just those identified on *Portland Harbor Superfund Site Record of Decision*^{14,15,16} (ROD) Table 17.
 - b) The analyte list should include total petroleum hydrocarbons (TPH).
 - c) Samples that contain spent oxides should be tested for pH.
 - d) DEQ does not require analysis of Portland Harbor ROD Table COCs if those COCs are not Gasco uplands COCs (e.g., chlorobenzene, perchlorate).
 - e) DEQ does not require PCB, DDx or dioxins/furans analysis.
 - 5) **Section 3.5, Phase II Grout Dosage Testing.** DEQ has the following comments:
 - a) DEQ is pleased that NW Natural is planning to incorporate additives into the treatability study, consistent with our comments^{17,18} on the *In Situ Stabilization and Solidification Laboratory Pilot Study Work Plan*¹⁹ and *In Situ Stabilization and Solidification Bench Scale Treatability Study*

¹⁴ EPA. 2017. Record of Decision, Portland Harbor Superfund Site, Portland, Oregon. United States Environmental Protection Agency Region 10, Seattle Washington. January.

¹⁵ EPA. 2020. Errata #2 for Portland Harbor Superfund Site Record of Decision ROD, Table 17. Memorandum from Sean Sheldrake to Portland Harbor Site File. January 14.

¹⁶ EPA. 2022. Errata #3 for Portland Harbor Superfund Site Record of Decision ROD, Table 6 and Table 21. Memorandum from Hunter Young to Portland Harbor Site File. September 7.

¹⁷ DEQ. 2023. Letter to Bob Wyatt (NW Natural). Regarding: DEQ Comments on the In-Situ Stabilization and Solidification Laboratory Pilot Study Work Plan, Former Gasco Manufactured Gas Plant Operable Unit, Portland, Oregon, ECSI #84, ECSI #183. January 18.

¹⁸ DEQ. 2023. Letter to Bob Wyatt (NW Natural). Regarding: DEQ Comments on the Revised In Situ Stabilization and Solidification Bench Scale Treatability Study Work Plan, Former Gasco Manufactured Gas Plant Operable Unit (Gasco OU), Portland, Oregon, ECSI #84, ECSI #183. March 15.

¹⁹ Anchor QEA, LLC. 2022. In Situ Stabilization and Solidification Laboratory Pilot Study Work Plan, Gasco Sediments Cleanup Action. Prepared on behalf of NW Natural. October 31.

*Work Plan*²⁰. These additives should be included in Phase I testing (and carried through to subsequent phases). DEQ notes that preliminary treatability testing results at a nearby site show promising leaching reduction performance with the addition of relatively low proportions of powdered biochar or activated carbon.

- b) The grout dose range appears low. DEQ requests including higher grout doses (e.g., 10%, 15%) during Phase II testing. DEQ questions the value in including very low grout doses (e.g., 3%) in the treatability testing scope.
 - c) DEQ requests that the grout dosage testing (and Phase I grout composition testing) include recording secondary indicators of grout performance, including the presence of any supernatant (liquid separation) on the top of the cores, and the physical condition of cylinders. Cracking or other evidence of physical degradation not captured by the physical tests should indicate the performance goals are not met.
 - d) This section states that the water-to-cement ratio will be evaluated to optimize the ISS-treated soil consistency. Please clarify what different water-to-cement ratios will be tested, and how this testing may affect the total number of mix designs evaluated.
 - e) DEQ requests strength testing at the 56-day interval to confirm longer-term durability of the mix design.
- 6) **Section 3.6.1, Phase III Leachability Testing.** Phase III leachability testing should include analysis for PAHs and TPH.
- 7) **Table D-1, Selected Soil Bench Scale Treatability Study Sample Locations, Depth Intervals, and Testing Program.** DEQ has the following comments:
- a) DEQ believes that a soil boring co-located with TS-10 would provide better information than a boring co-located with PW-4L.
 - b) DEQ does not approve collecting samples from the currently proposed ISSUTS-006 location. This boring location is outside of the approved IRAM footprint and does not contain MGP residuals. We believe it is unlikely that samples from this location would be selected for treatability testing. Either relocate ISSUTS-006 to a location within the approved IRAM or remove it.
- 8) **Figure D-4, Overview of Phase III and IV Leachability Testing.** DEQ has the following comments:
- a) Separate leachability testing should be conducted for samples containing different MGP residuals. For example, leach testing of treated soil containing spent oxides should be conducted in addition to leach testing of treated soil containing dense non-aqueous phase liquid (DNAPL).
 - b) Separate leachability testing should be conducted for different soil textures. For example, leach testing of treated soil containing DNAPL in the upper alluvium should be conducted in addition to treated soil containing DNAPL in the lower alluvium.

²⁰ Anchor QEA, LLC. 2023. Revised In Situ Stabilization and Solidification Bench Scale Treatability Study Work Plan, Gasco Sediments Cleanup Action. Prepared on behalf of NW Natural. February 16.

Attachment 3 DEQ Comments on the IRAM DGWP

Introduction

DEQ does not approve the IRAM DGWP. Our comments on the IRAM DGWP are provided below.

Specific Comments

- 1) **Section 1, Introduction.** DEQ has the following comments:
 - a) The second paragraph states that the ISS barrier wall extends a distance of 350 feet onto the Siltronic property. DEQ has not approved a set distance for the ISS barrier wall to extend onto the Siltronic property. Consistent with our *Gasco OU Interim Removal Action Decision*²¹ (IRAM Decision), the ISS barrier wall extends south onto the adjacent Siltronic property to a location that coincides with the lateral extent of DNAPL in the Alluvium water-bearing zones. DEQ understands that NW Natural will refine the estimated DNAPL extent along the Siltronic shoreline with data collected during the IRAM pre-design investigation. DEQ does not approve descriptions of the IRAM scope that do not match our IRAM Decision.
 - b) DEQ does not approve the last sentence of this section as written. Delete “particularly at saturation levels considered to be potentially mobile.”
- 2) **Section 2.1, Soil Boring Locations and Rationale.** This section proposes collecting one composite soil sample per each 1,500 cubic yard ‘bin’ to satisfy disposal facility sample density requirements. However, the *Contaminated Material Management Plan*²² (CMMP) requires one sample per 500 cubic yards. Revise the IRAM DGWP to reflect the sampling frequency described in the CMMP.
- 3) **Section 3.1.1, Soil Sampling Methods.** Discrete samples for VOC analyses should be collected immediately after the core is opened (and before homogenization) to minimize loss of volatiles.
- 4) **Section 3.5, Equipment Decontamination.** Please add a solvent rinse step (e.g. hexane) if visible contamination is observed (e.g. non-aqueous phase liquid, tar, etc.).
- 5) **Section 4.4, Monitoring.** A minimum of four quarterly groundwater samples should be collected from the newly installed monitoring wells and analyzed for the full suite of Gasco OU groundwater COCs for the groundwater to surface water pathway.
- 6) **Section 6, Reporting.** This section only discusses reporting for the pre-characterization soil sampling. Clarify when the rest of the data described in the IRAM DGWP will be reported.
- 7) **Figures E-2, Bin Location Overview.** DEQ has the following comments:
 - a) The IRAM DGWP figures show ‘500-cy sub-bins,’ but the sub-bin concept is not discussed in the IRAM DGWP. Please clarify the sampling strategy and the use of sub-bins.
 - b) Several bins extend beyond the approved ISS barrier wall alignment. DEQ understands that the *Revised Gasco OU Segment 3 – Alluvium WBZs Source Control Evaluation*²³ presents information intended to justify extending the ISS barrier wall further onto Siltronic’s property. DEQ will approve collection samples from Bins 1 through 6, with the understanding that DEQ approval to extend the ISS barrier wall has not been made and is not guaranteed.

²¹ DEQ. 2024. Letter to Bob Wyatt (NW Natural), Regarding: Gasco OU Interim Removal Action Decision, Former Gasco Manufactured Gas Plant Operable Unit, Portland, Oregon, ECSI #84 and #183. July 3.

²² Anchor QEA, LLC and Hahn and Associates, Inc. 2021. Contaminated Material Management Plan. Prepared for NW Natural. November 19.

²³ Anchor QEA. 2025. Revised Gasco OU Segment 3 – Alluvium WBZs Source Control Evaluation. Prepared for NW Natural. July 28.